MULTIMEDIA UNIVERSITY

STUDENT ID NO

Seat No.: | | | |

Venue: _____

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2019/2020

TGD2151 – COMPUTER GRAPHICS FUNDAMENTALS

(All sections / Groups)

22 OCTOBER 2019
9.00 a.m. – 11.00 a.m.
(2 Hours)

Question No.	Marks
1	
2	
3	
4	
Total	

INSTRUCTIONS TO STUDENTS

1. This Question paper consists of 7 pages with 4 Questions only.

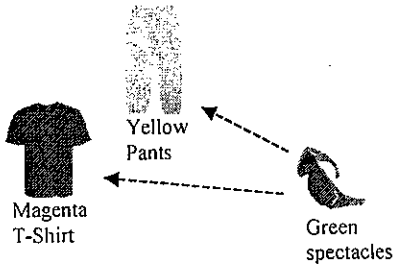
2. Answer **ALL FOUR** questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please write all your answers CLEARLY in this Question paper.

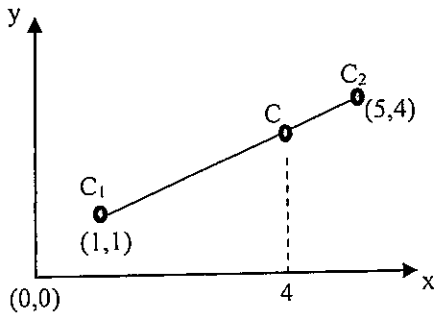
QUESTION 1

a) RGB and HSV are two common color models used in Computer Graphics for screen display purpose. However, when we extract a color from an image, the HSV color model is usually more preferred than RGB color model. Why? [2 marks]

b) Ali was wearing a green color spectacle, looking at a magenta T-shirt and a yellow pants. What color did Ali see for the T-shirt and the pants? Explain your answer using AND operator for the color code. [3 marks]



c) A roll of cloth is dyed with color interpolated from C_1 (**cyan** color) to C_2 (**red** color). Find the color at position C? [3 marks]



Continued...

d) A straight line, L passed through a plane equation $3x - 7y + 4z - 20 = 0$ orthogonally and stopped at a point (2, -4, 1). Find the parametric equation of the line. [2 marks]

QUESTION 2

a) Using the Bresenham's line drawing algorithm below, find the pixel coordinates from point P_0 (6, 9) to P_5 (11, 12). [2 Marks]

$F_0 = 2h - w$ where h = height and w = width
Given $F_k < 0$, $y_{k+1} = y_k$, then $F_{k+1} = F_k + 2h$
Given $F_k \geq 0$, $y_{k+1} = y_k + 1$, then $F_{k+1} = F_k + 2(h - w)$

k	X_k	F_k	Y_k
0	6		
1			
2			
3			
4			
5			

b) A normal vector of a flat surface is (3, 6, 2). Justify the visibility of the surface to
i) Viewer A who is looking at direction (5, 1, 3).
ii) Viewer B looking at direction (3, -4, 2). [3 marks]

Continued...

c) Painter's algorithm (also known as a priority fill) renders the polygons from back to front, "painting over" previous polygons. This algorithm is fast and simple, but there are three limitations. List down the three (3) limitations. [3 marks]

d) Given two OpenGL projection codes below, draw and label them accordingly.
- **Parallel** projection: glOrtho (-4, 4, -5, 5, 0, 100);
- **Perspective** projection: gluPerspective (45, 2, 0, 100); [2 marks]

Parallel projection	**Perspective** projection

QUESTION 3

a) (i) What does it mean by Affine Transformation in Computer Graphics? [1.5 marks]
(ii) List down three (3) properties of an affine transformation matrix. [1.5 marks]

b) A 2D object is rotated 90 degree counter-clockwise about **Z**-axis, followed by the scaling factor at (2, 3). Then, it is translated with translation factor (6, 5). Compute the Composite matrix, C_m for the above transformation.

[4 marks]

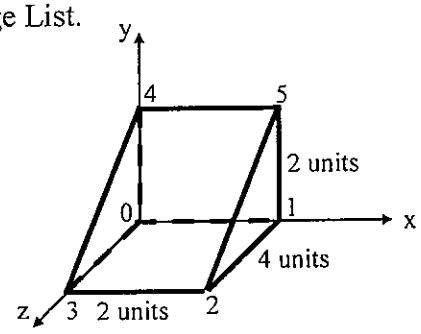
c) Find the intensity of the ambient light and diffuse reflection at a sphere if the normal vector of the sphere is $\boldsymbol{N}$ (0, 0, 1), the unit light vector $\boldsymbol{L}$ is (-0.707, 0, 0.707), the ambient and diffuse light are $I_a = 0.8$ and $I_d = 0.9$ respectively, and the coefficient of the ambient and diffuse light are $K_a = 0.5$ and $K_d = 0.5$.

[3 marks]

Continued...

QUESTION 4

a) Given the following object, complete the tables below for the Vertex List, Face List, Normal List and Edge List. [5 Marks]



Vertex List			
Index	x	y	z
0			
1			
2			
3			
4			
5			

Face List			
P_w	P_x	P_y	P_z
3		5	
1		4	
2		0	
5		1	-1
4		3	-1

Normal List		
N_x	N_y	N_z

Edge List	
E_i	E_j

Continued...

b) Given three (3) control points of a Bezier curve as $P_0 = (3, 3)$, $P_1 = (5, 7)$ and $P_2 = (10, 2)$. What is the coordinate on the curve when the ratio $u = 0.1$ and $u = 1.0$?

[4 Marks]

c) What is the OpenGL command to set for Flat shading and Gouraud shading method.

[1 Mark]

The end!